

RULE 132
DECLARATION

IN THE UNITED STATES PATENT OFFICE

Application number: 10/567,914

Art unit: 3749

First named inventor: Jan Kristensson

Title: Air supply device.

Filing Date: February 7, 2006

Examiner Name: Samantha A. Miller

Attorney Docket Number: 132763

Declaration of Professor Sture Holmberg
Pursuant to 37 CFR 1.132.

Honorable Commissioner of Patents and Trademarks
Washington DC, 20231

Sir:

I, Professor Sture Holmberg, declare and state as follows:

1. I reside at Prostvågen 17C, 142 43 Huddinge Sweden.
2. I am currently Professor of Fluid and Climate Theory at the Royal Institute of Technology (KTH) in Stockholm Sweden. I am also head of the research division for Fluid and Climate Technology at the School of Architecture and Built Environment, KTH.
3. I am one of skill in the art of fluid flow and heat transfer in buildings. Fluid flow modelling and Computational Fluid Dynamics (CFD) are important parts of research and development of this area. My research area includes ventilation and heating of indoor environments. I received my MSc degree in Chemical Engineering from Åbo Akademi, Finland, and my Ph.D. in Heating and Ventilation from the Royal Institute of Technology (KTH), Stockholm, Sweden. [Attached as exhibit A is a copy of my resume].

4. I am working as an active scientist continuously writing and reviewing scientific reports, supervising PhD students, writing research proposals, going to conferences, etc. A research assessment exercise (RAE 2008, KTH), where international expert panels were involved, gave my division FCT (Fluid and Climate Technology) high scientific scores and concluded: 'The panel considers the standard of these research activities to be at the higher end of international activities in similar research areas.'

5. An introduction to the problem.

I here find it important to give a simple introduction to fundamental fluid flow behaviour, which I believe will be useful for understanding of later presented statements.

An air jet is formed when supply air from an orifice is surrounded by stationary air. A jet belongs to a category of fluid flows called free turbulent flows. After the flow emerges from the orifice the laminar exit flow produces the rolling up of a vortex. Transition to turbulence occurs after a very short distance in the flow direction. The initial movement of the air jet will lose momentum to speed up the stationary surrounding air. Owing to velocity gradients and entrainment of surrounding air a turbulent air jet will expand forward in a conical shape, [1]. In clean room applications perforated ceiling with many small air-supply outlets close to each other are used to generate laminar and parallel air flow through the room. Turbulence generating velocity gradients and entrainment from surrounding air will in this homogeneous flow pattern be decreased.

6. I am providing this declaration pursuant to 37 CFR 1.132 to address the Examiner's obviousness rejection under 35 USC 103(a), in which it is concluded that it would have been obvious to one skilled in the art to modify the air supply device of Kristensson described in US 5,167,577 in view of the teaching of DE 2608792 "in order to reduce the exhaust velocity." [An English translation of DE2608792 is attached as Exhibit B]. Specifically, I attest to what one skilled in the art would understand from the disclosures of DE2608792 and the present application, concerning the respective mechanisms of "reduction of exhaust velocity" that are disclosed.

7. I am further providing this declaration to attest to whether one reasonably skilled in the art would expect that the device described in DE 2608792 comprises "rectilinear" (parallel) air passages.

8. I am further providing this declaration to attest to whether one reasonably skilled in the art would expect that the device described in DE 2608792 could produce substantially laminar air flows.

9. In my opinion, one skilled in the art will readily comprehend from the disclosure of the present application that straightening of exhaust air is achieved by use of certain air supply nozzles packed in a honeycomb profile. A uniform velocity profile and laminar flow conditions will now maintain far downstream from the supply outlet. The elimination of internal velocity gradients in the flow stream makes entrainment and transition to turbulent flow conditions much more difficult. In addition to this a mass force due to negative buoyancy (temperature gradient) helps to orientate and stabilize every flow particle in the direction of a vertical parallel flow. The negative buoyancy, i.e. the negative temperature gradient between flow field and ambient air, is also expected to decrease entrainment of ambient air into the flow region. This because the whole boundary region will partly be cooled and smoothly downward oriented with the passing fluid. A density difference between the flow region, which is colder and denser than ambient air, will further prevent entrainment of ambient air into the flow region. By avoiding entrainment turbulent mixing of the flow region will also be avoided. The idea to create laminar and parallel flow conditions with concentrated air supply and not like usually by large perforated surfaces has here been realized to a great extent.

10. In my opinion, one skilled in the art will readily comprehend from the disclosure of DE2608792 that "reduction of exhaust velocity" is achieved by use of "expanding jets" whereby the cross area of the downstream expanding cone increases according to the given ratio $v_2 = v_1 \cdot r_1^2 / r_2^2$. In my opinion, one skilled in the art will realise that such expansion of the jet is impossible without entrainment of "new" ambient air from the boundaries. As described above (5) entrainment means mixing and transition to a turbulent flow structure in the expanding jet. In contrast, the air supply device of the present (Kristensson) application achieves better control of the flow structure by the under-temperature (i.e. cooling) of the supply air. The under-temperature is influencing both initial momentum (vertical flow orientation) and boundary layer to ambient air.

11. In my opinion, one skilled in the art could not reasonably conclude that the device described in DE 2608792 comprises "rectilinear" air passages.

12. In my opinion, one skilled in the art could not reasonably conclude that the device described in DE 2608792 could produce substantially laminar air flows. In addition to what is said above (5 and 10) the "protective layer of wire mesh" will disturb the out coming flow pattern and speed up transition to a turbulent flow structure in the expanding jet. The supply jets are here oriented with intention to create a conical expansion of out coming air.

13. In my opinion the air supply device of the present application improves over the prior art devices of US 5,167,577 by reducing undesired turbulence. The improved laminar and rectilinear flow conditions of the claimed device provide a directional effect that helps minimize the turbulence zone associated with discharge of clean air from the device.

14. I declare that all statements made herein are made of my own scientific knowledge including reference. My declaration should be looked upon as a scientific assessment and explanation of a specific complex flow phenomenon. Turbulence modelling is one of the most complex areas of science with several parts and details not fully understood. If something in my assessment of this particular air supply system would be shown incorrect, which I have done all my best to avoid, my prestige as a leading scientist of this area would badly suffer. However, I do not take any legal or economic responsibility for my statements and the content in this declaration.

Reference:

[1] Versteeg HK and Malalasekera W, An introduction to computational fluid dynamics, Longman, 1994.

Feb. 11, 2010 Haminge

Date and place

Sture Holmberg

Professor Sture Holmberg

EXHIBIT A

CV, Brief Curriculum Vitae

Sture K M Holmberg

PhD, Professor

Date of Birth:

27th of June, 1951

Current Position:

Head of Division, Fluid and Climate Technology, School of Architecture and Built Environment, Royal Institute of Technology (KTH)

Address: Marinens väg 30, SE-136 40 Haninge-Stockholm, Sweden

Contact numbers:

Tel No: +46-8-7909775, +46-(0)70-5643430; Fax No: +46-8-7904800,
E-mail: sture.holmberg@sth.kth.se

Qualifications:

- MSc, School of Chemical Engineering, Åbo Akademi, Finland, 1978
- PhD, School of Mechanical Engineering (Heating and Ventilation), Royal Institute of Technology (KTH), Stockholm, 1987
- Associate Professor (docent), School of Architecture, Surveying and Civil Engineering (Indoor Climate and Ventilation), KTH, 1999
- Professor, School of Technology and Health (Fluid and Climate Theory), KTH, 2007

Research Experience: From 1979 to 1989 Sture Holmberg was responsible for research and development projects in building fluid dynamics at the National Swedish Institute for Building Research (SIB). In 1990 Professor Holmberg joined the Swedish National Institute for Working Life (Arbetslivsinstitutet). His research activities there included: evaluations of modern ventilation concepts, investigations of the function of different air distribution principles, development of ventilation efficiency measures, and numerical methods to predict air and particle flows in work environments. In January 1998 joined the Department of Built Environment, Royal Institute of Technology (KTH) and in May 2000 he became head of the Building & Construction Engineering Program at KTH STH, Campus Haninge. In 2008 he became the head of his own research division Fluid and Climate Technology.

Overseas visits

In 1996 Holmberg was visiting scientist at Advanced Thermal Technologies Laboratory, CSIRO Australia in Melbourne. In the spring of 1999 he was a visiting scientist at the Massachusetts Institute of Technology (MIT).

Other scientific achievements

Licentiate and/or doctoral students

Main supervisor of PhD students:

- Gery Einberg, PhD degree in 2005
- Jonn Are Myhren, Licentiate degree in 2008

Joint supervisor of PhD students:

- Shia-hui Peng, PhD degree in 1998,
- Yuguo Li, PhD degree in 1992,

Doctoral students at present

- Jaideep Guha
- Jonn Are Myhren
- Marko Granroth
- Shi-Ying Chen
- Thomas Alsmo
- Adnan Ploskic

Engineering degrees

Main supervisor of 31 project degree works (undergraduate)

Review assignments (International Journals)

Peer Reviewer

- International Journal of Heat and Fluid Flow, Influence of a Moving Object on the Airflow inside an Open Ventilated System - An Experimental and Numerical Analysis, Ref. No.: HFF-D-09-00006, 2009
- International Journal of Thermal Sciences, Numerical investigation for the celing inclination angle of inlet air-jet on room airflow patterns, Ref. No.: THESCI-D-09-00468, 2009
- Safety Science, Study on Methods of Calculating Dynamic Air Exchange of Rate in Door of Ventilation, SAFETY-D-09-00084, 2009
- Particuology, Effects of supply air temperature and inlet location on particle dispersion in displacement ventilation rooms, Ref. No.: PARTIC-D-09-00102, 2009
- Building and Environment, *Indoor environment factors and children health problems*, BAE-D-08-00240, 2008
- Building and Environment, *Air quality in hospital operating rooms*, 2007, BAE-D-07_00650
- Indoor Air, *..Contaminant transport in an operationg room*, 2006, INA-05-12-146.R1
- CIGR Ejournal Review, *BC 06 04, 2006, Low momentum air supply..*
- Pre-review, *Thermal conditions and dust..* asked by Prof. L. Pawlowski, Politechnika Lubelska, 2006
- Atmospheric Environment, once per year (the two last years 2006)
- Progress in Computational Fluid Dynamics, once in 2005
- Chemosphere (Elsevier), once in 2005

Invited speaker:

Holmberg, S; Keynote presentation International Conference on Sustainability in Energy and Buildings SEB'09, Brighton, UK, 2009

Holmberg, S; Modelling of low-temperature heating systems in buildings, World Renewable Energy Conference (WREC), Glasgow, July. 2008

Holmberg, S; CFD guidelines for room airflow, Workshop at University of Coimbra, Portugal, Sept. 2004

Holmberg, S; Air Flow and Particle Control in a Ventilated Room, University of Hong Kong (HKU), May 25, 2001

Holmberg, S; The Role of Air Supply and Exhaust Conditions in Room Ventilation, Building Technology Program, Massachusetts Institute of Technology (MIT), April 26, 1999

Holmberg, S; Indoor Environment Aerosols: Dispersion and Deposition Modelling, Advanced Thermal Technologies Laboratory, CSIRO Australia, Highett, December 3, 1996

Assignments as public examiner/opponent

PhD examining board member, doctoral thesis (betygsnämnd):

- KTH; Dimitra Sakellari (respondent), June, 2005 (board chair Sture Holmberg)
- LuTH; Qiuqing Geng (repondent), April, 2001 (board chair Sture Holmberg)
- LuTH; Kalev Kuklane (respondent), Feb. 2000
- KTH; Tyrell Burt (respondent), 1999

Faculty opponent (tech. lic.):

- KTH; Gery Einberg (respondent), Feb., 2001
- KTH; Valentino Todde (respondent), 1998

Assignments as outside expert

- Project assessment, City University of Hong Kong, 2008, ref. 2007SRG033(BC)
- Lecturer assessment, (Dnr PA 2008/279, LTH, 2008)
- University Grant Committee, Hong Kong, (permanent reviewer)
- Basic Research Grants, Scientific Foundation Ireland, once in 2004
- Senior Lecturer assessment, (Dnr LTH E321 716/2003), University of Lund, 2003
- Senior Lecturer assessment, (Dnr 21-1645/01), University College of Gävle, 2001
- *Extension of bachelor program in building technology with 60 weeks. An evaluation group has been formed with Sture Holmberg as foreign expert, Vasa, Finland, 2001, reference person Christer Vikström*
- *The Swedish Council for Work Life Research (RALF), Research proposal assessment and member of reference group, Air quality in saw industry, 2000, reference person Bo-Ingemar Johansson*

Seminar chair person (conference)

Several chair person assignments. Some selected below:

- Session Chair of international EERB-BEPH 2009 Conference, Guilin, China
- Healthy Buildings, 2006, Lisbon

- Roomvent 2004, Air distribution in rooms, Coimbra, Portugal
- Roomvent 2002, Air distribution in rooms, Copenhagen, Denmark

Review assignment (conference):

- *Indoor Air 2005, International Conference on Indoor Air Quality and Climate*
- *7th International Conference on Air Distribution in Rooms (Roomvent 2000), University of Reading, UK*

Member of scientific committee: (conference)

- EERB-BEPH 2009, Energy and Environment, Guilin, China
- ISHVAC 2007, Intern. Symposium, Tsinghua University, Beijing
- Tsinghua-HVAC-2003, 2003, Beijing, China

Rapporteur: (conference)

- Clima 2007; Work Shop, Well Being Indoors, 10-14 June, Helsinki
- Technical sessions, Indoor Environment (report from 26 papers), *7th International Conference on Air Distribution in Rooms (Roomvent 2000), University of Reading, UK*

National and international awards

Supervisor for awarded project degree work, ByggOpus 2005, Stockholm
Jubilee awarded, Stockholms Byggnadsförening, 1998

Membership of academies and the like

Founder and constitutional member, Skärgårdsnationen vid Åbo Akademi

List of publications (Prof. Sture Holmberg, KTH)

Selected articles are given below.

Papers published in internationally reputed periodicals:

- Ploskic A and Holmberg S, *Heat emission from thermal skirting boards*, Building and Environment, accepted 2009
- Myhren J A and Holmberg S, *Design considerations with ventilation-radiators: Comparisons to traditional two-panel radiators*, Energy and Buildings 41 (2009) 92–100
- Alsmo T and Holmberg S, *A study of sources of air-borne pollutants and poor hygiene in schools*, Indoor and Built Environment, accepted 2009
- Guha J and Holmberg S, *A Numerical and Experimental Evaluation of a Natural Wind Driven Suction Cylinder for Building Ventilation*, International Journal of Ventilation, Volume 7 No 3 December 2008
- Myhren J A and Holmberg S, *Flow patterns and thermal comfort in a room with panel, floor and wall heating*, Energy and Buildings, 40, 2008, pp. 524-536
- Alsmo T and Holmberg S, *Sick buildings or not: Indoor air quality and health problems in schools*, Indoor and Built Environment, 2007; 16; 6:548-555
- Myhren J A and Holmberg S, *Design considerations with ventilation-radiators: Comparisons to traditional two-panel radiators*, Energy and Buildings, submitted in February 2008

Einberg G, Laine T and Holmberg S, CFD Modelling as a Part of Integrated Design Process for Optimized Indoor Environment, submitted to *Automation in Construction*, 2005

Einberg G, Hagström K, Mustakallio P, Koskela H, Holmberg S, *CFD Modelling of an industrial air diffuser – predicting velocity and temperature in the near zone*, Building and Environment 40, pp. 601-615, 2005

Holmberg, S and Chen Q (2003). *Air flow and particle control with different ventilation systems in a classroom*, International Journal of Indoor Air Quality and Climate, Indoor Air, 13; 200-204

Einberg G, and Holmberg S, *Characteristics of particles and their behaviour in ventilation air*, International Journal of Ventilation, Volume 2, No 1, 2003

Other publications (proceedings):

Holmberg S, Alenius S and Chen Shih-Ying, Drug-resistant bacteria in hospital wards – the role of ventilation, Proceedings of Health Buildings, New York, 2009

Ploskic A and Holmberg S, *Heat emission from skirting boards – an analytical investigation*, International Conference, EERB-BEPH, May 2009, Guiling, China

Holmberg S, *The influence of room air flow and turbulence on heat transfer from human body – a new comfort model consideration*, Indoor Air 2008, 11th International Conference on Indoor Air Quality and Climate, August 17-22, Copenhagen, 2008

Holmberg S, *Modelling of low-temperature heating systems in buildings*, World Renewable Energy Conference, WREC 2008, 19-25 July, Glasgow, 2008

Holmberg S, *The influence of room air flow and turbulence on heat transfer from human body – a new comfort model consideration*, Indoor Air 2008, 11th International Conference on Indoor Air Quality and Climate, August 17-22, Copenhagen, 2008

Myhren J A and Holmberg S, Performance of ventilation radiator, Clima 2007, Helsinki, 11-14 June, 2007

Myhren J and Holmberg S, Summertime cooling with ventilation radiators, IAQVEC 2007, October 28-31, Sendai, Japan

Alsmo T and Holmberg S, *Causes of Poor Air Quality in Swedish Schools*, Healthy Buildings, 4-8 June, Lisbon, Portugal, 2006

Granroth M and Holmberg S, *Health and productivity in commercial buildings - thermal and hygienic aspects*, Healthy Buildings, 4-8 June, Lisbon, Portugal, 2006

Guha J and Holmberg S, *Affectivity of a Suction Cylinder as Ventilation Equipment*, Healthy Buildings, 4-8 June, Lisbon, Portugal, 2006

Myhren J and Holmberg S, *Comfort temperatures and operative temperatures in an office with different heating methods*, Healthy Buildings, 4-8 June, Lisbon, Portugal, 2006

Einberg G, Koskela H and Holmberg S, *CFD Simulation and Measurements in Near Zone of High Induction Swirl Diffuser*, Roomvent 2004, Proceedings of the 9th International Conference on Air Distribution in Rooms, Coimbra, Portugal 5 - 8 Sept., 2004

Holmberg S, F Molin and J Myhren, *Space heating at low temperature difference between heating unit and ambient air*, Proceedings of the 9th International Conference on Air Distribution in Rooms, Coimbra, Portugal 5 - 8 Sept., 2004

Novakovic K and S. Holmberg, *The influence of air speed and turbulence intensity on thermal comfort in vehicles*, Proceedings of the 9th International Conference on Air Distribution in Rooms, Coimbra, Portugal 5 - 8 Sept., 2004

Guha J and Holmberg S, *Forcing natural ventilation resources in a hybrid ventilated facility at KTH*, Roomvent 2004, Proceedings of the 9th International Conference on Air Distribution in Rooms, Coimbra, Portugal 5 - 8 Sept., 2004

Einberg G, Holmberg S, *Particle Removal Efficiency in a Numerical Test Room*, ISHVAC 2003, The 4th International Symposium on Heating, Ventilation and Air Conditioning, Beijing, China 9-11th October, Volume I, 2003

EXHIBIT B

(51)

Int. Cl. ²: F 24 F 13/06

(19) FEDERAL REPUBLIC OF GERMANY

GERMAN PATENTS OFFICE

DT 26 08 792 A1

(11) **Publication of an Unexamined Application 26 08 792**

(21) Ref.: P 26 08 792.3

(22) Date of application: 3. 3. 76

(43) Date of publication: 8. 9. 77

(30) Union priority:

(32) (33) (31) --

(54) Designation: Multiple jet to generate radial displacement flows

(71) Applicant: Piederstorfer, Josef, 8025 Unterhaching

(72) Inventor: same as applicant

(56) Publications to be considered for the evaluation of the patentability:

DT-PS 5 77 373

DT-PS 4 69 866

DT-Pat.Reg. 10 030 V/36d of 20.10.55

DT-OS 24 55 143

DT-OS 20 43 892

CH 2 68 474

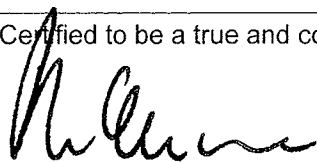
GB 13 33 658

DT 26 08 792 A1

8.77 709836 / 280

3/60

Certified to be a true and complete translation of the original (p. 1).



P.W. McKenna, Wednesday, 30 September 2009

Authorised translator for German and English,

Oberlandesgericht Hamm (Hamm Higher Regional Court), Germany,

3162 E - 1.2439



Patent claims:

1. Multiple jet to generate a radial directed displacement flow, in particular for so-called clean rooms,

characterised by a cylindrical air intake connection running into the circular cross-section of a spherical cap whose curved surface consists of a great number of conical jets arranged in the form of a honeycomb whose aperture angle is less than 15° and of a woven retaining layer arranged on the blower side and a wire mesh protection layer arranged on the extractor side.

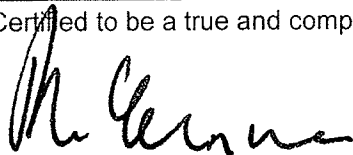
2. Device in accordance with Claim 1 characterised by being located in a clean room work zone in such a way that its radial displacement flow is directed against the surrounding disturbance sources.

3. Device in accordance with Claim 1 characterised by being integrated in the support of an operating lamp whose bearing pipe serves as the clean-air lead-in.

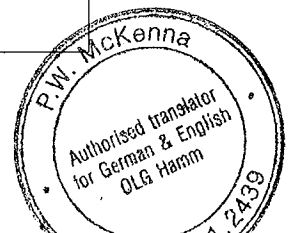
709836 / 0280

BAD ORIGINAL

Certified to be a true and complete translation of the original (p. 2).



P.W. McKenna, Wednesday, 30 September 2009
Authorised translator for German and English,
Oberlandesgericht Hamm (Hamm Higher Regional Court), Germany,
3162 E - 1.2439



Josef Piedersdorfer
8025 Unterhaching

2608792

- 2 -

Multiple jet to generate radial displacement flow.

The invention refers to a device for air intake at a limited clean-room work area. In industrial manufacturing processes and especially in aseptic operations, dust-free or germ-free work conditions in the work zone or the operation zone are generated by means of clean air displacement flows.

In order to meet these requirements, it is known that workrooms or operation theatres have to be ventilated in such a way that turbulence-free displacement flows, coming from one side of the room, either horizontal or vertical or even diagonal, are generated, which flow through the entire room cross-section and deviate floating particles from the clean-room, and shall also conduct the particles, spread by work processes and human beings, towards the exhaust air outlet opposite the supply air inlet. Moreover, another arrangement is known, where a clean air flow is conducted towards an operating area through an axial and turbulent, diagonally directed jet.

In order to work well, these known systems require a very disciplined behaviour of the employees in the clean-room. Contaminated air often reaches the clean area through disturbing bodies like lamps, technical devices, human beings and thermal buoyancy. The energy expenditure corresponds to the big flow cross-sections.

The invention is intended to eliminate the incalculable influence of the disturbance sources and to reduce the energy and investment expenditure.

This task is resolved, according to the invention, by the fact that the clean air intake is placed between the clean-room and the disturbance source and that the clean air is conducted radially against the disturbance sources.

-2-

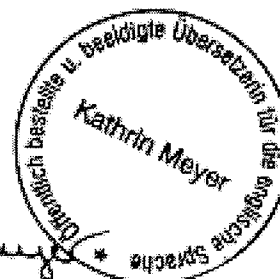
709836/0280

As publicly ordered and generally certified translator in Bavaria for the English language, I hereby confirm that this translation of the document submitted to me as a copy and written in the German language is true and correct.

Als in Bayern öffentlich bestellte und allgemein beeidigte Übersetzerin für die englische Sprache bestätige ich: Vorstehende Übersetzung der mir als Kopie vorgelegten, in deutscher Sprache abgefassten Urkunde, ist richtig und vollständig.

Garbsen, March 20, 2008

Kathrin Meyer
Im Tiefenbruch 11
D-30827 Garbsen



A dome-shaped multiple jet conducts radially directed clean air over the clean zone. By means of a retaining layer placed in front of the honeycombed jet casing and the numerous radially arranged expanding jets, below an angle which is smaller than 15° , a basically induction-free and conical expansion of the supply air and a reduction of the exit velocity according to the relationship $v_2 = v_1 \cdot r_1^2 / r_2^2$ is achieved. This flow behaviour, otherwise only observed at exhaust outlets, results in the absence of draught, even in a short distance.

The advantage achieved by this invention consists especially in the fact that restrictions, imposed on the staff with known systems, become unnecessary, impairments of the operational reliability are eliminated and the investment and energy expenditure is reduced.

An arrangement above the operating tables is of special advantage, where the described multiple jet is integrated into the support of an operating lamp and where the support is dimensioned in such a way that the bearing flanged pipe serves as a clean air lead-in towards the multiple jet arranged at the lower, frontal end of the support, since the swivel range of the lamp is not impaired in this way and flow disturbances through luminous bodies are avoided.

The drawing shows design examples of the invention.

Fig. 1 shows a sectional detail view through a multiple jet.

- 1 supply air nozzles
- 2 layer of retaining tissue
- 3 honeycombed jet casing
- 4 protection layer made of wire mesh

Fig. 2 illustrates in a cross-section through a room to be ventilated the arrangement of the air intake device at the supporting tube of an operating lamp as well as the radially directed displacement flow.

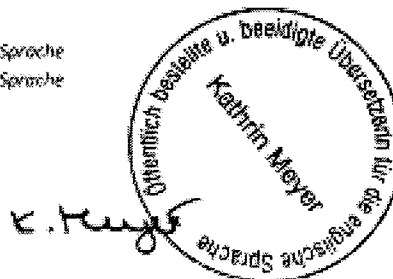
709836/0280

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Garbsen, March 20, 2008

Kathrin Meyer
im Tiefenbruch 11
D-30827 Garbsen



⑥

Int. Cl. 2:

F 24 F 13/06

⑯

BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES



PATENTAMT

DT 26 08 792 A 1

⑪

Offenlegungsschrift 26 08 792

⑫

Aktenzeichen:

P 26 08 792.3

⑬

Anmeldetag:

3. 3. 76

⑭

Offenlegungstag:

8. 9. 77

⑳

Unionspriorität:

③② ③③ ③①

⑤④

Bezeichnung:

Mehrfachdüse zur Erzeugung radialer Verdrängungsströmungen

⑦①

Anmelder:

Piederstorfer, Josef, 8025 Unterhaching

⑦②

Erfinder:

gleich Anmelder

⑤⑥

Für die Beurteilung der Patentfähigkeit in Betracht zu ziehende Druckschriften:

DT-PS 5 77 373

DT-PS 4 69 866

DT-Pat.Anm. Sch 10 030 V/36d v. 20.10.55

DT-OS 24 55 143

DT-OS 20 43 892

CH 2 68 474

GB 13 33 658

DT 26 08 792 A 1

Patentansprüche:

1. Mehrfachdüse zur Erzeugung einer radialen gerichteten Verdrängungsströmung insbesondere für sog. reine Räume, dadurch gekennzeichnet, daß ein zylindrischer Zuluftstutzen in die kreisförmige Schnittfläche einer Kalotte einmündet, deren gekrümmte Fläche aus einer Vielzahl wabenförmig angeordneter konischer Düsen deren Öffnungswinkel kleiner als 15° ist und einer anströmseitig angeordneten Gewebestauschicht und einer abströmseitig angeordneten Drahtgeflechschuttschicht besteht.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß sie an einer Reinraum Arbeitszone derart angeordnet ist, daß ihre radiale Verdrängungsströmung gegen die umliegenden Störquellen gerichtet ist.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß sie in die Konsole einer Operationsleuchte integriert ist, deren Tragrahr der Zuluftführung dient.